Captina Creek near Ohio Valley Coal and American Energy summarized from the 2009 Biological and Water Quality Study of the Captina Creek Watershed - OEPA Report DSW/EAS 2010-4-1

SUMMARY

The Captina Creek mainstem sites sampled during 2008 and 2009 attained the Exceptional Warmwater Habitat fish and macroinvertebrate biocriterion at all 11 sites evaluated (100%). Fifty four species of fish were found and an impressive 17.5 percent of the fish population in Captina Creek was comprised of fish species intolerant of water pollution. Additionally, some of Ohio's highest values for total macroinvertebrate taxa richness (average of 84.3 taxa per site) and pollution sensitive taxa (average of 42.4 taxa per site) were documented at Captina Creek sites during 2008 and 2009. The exceptional biological integrity of the fish and macroinvertebrate community in Captina Creek is comparable to several of the best streams in Ohio including Big Darby Creek and the Kokosing River. Over the last 26 years of monitoring biological communities in Captina Creek, exceptional fish and macroinvertebrate populations have been maintained.

Water quality throughout the watershed has been consistently good despite historic and active coal mining. The limestone geology of the area has buffered acidic contributions and has kept the pH levels in the range acceptable for supporting aquatic life. Ohio Valley Coal Company (OVCC) and American Energy Corporation (AEC), both owned by Murray Energy, have permitted NPDES discharges located in Perkins Run and Piney Creek which discharge to the upper section of Captina Creek. Elevated levels of total dissolved solids (TDS), metals and conductivity were found during the 2008 and 2009 survey in Captina Creek, Perkins Run and Piney Creek below the two mine discharges. In some cases, levels of TDS and metals exceeded the applicable water quality standards and also exceeded current NPDES permit limits for OVCC and AEC. Coal slurry waste has been released from both the OVCC slurry impoundment as well as from an AEC pipeline which crosses Captina Creek. The slurry is typically a thick, viscous, black material that can potentially smother aquatic life and contains numerous organic and metal contaminants. Contaminated sediments were found in Perkins Run and in Captina Creek downstream from where the slurry spills have occurred. These sediments have not caused biological impairment at the time of sampling but long term chronic exposure could result in future impacts to aquatic life.

RECOMMENDATIONS

Captina Creek should retain the Outstanding State Water (OSW) antidegradation classification based on the presence of a state endangered species (Eastern Hellbender), declining fish species and high mean IBI and ICI scores. State endangered Eastern Hellbender salamanders have been found throughout the Captina Creek watershed. Captina Creek is one of the only locations in the state of Ohio where juvenile Eastern Hellbender salamanders have been found indicating that the adults are reproducing. Eastern Hellbender populations found in other watersheds have been older adults with no juveniles found indicating that reproduction is not occurring.

During low flow conditions, the water quality of Captina Creek is dominated by the discharges from the American Energy Mine (AEC) and the Ohio Valley Coal Company (OVCC) mine. Ohio EPA

documented that the conductivity of Captina Creek exceeds reference conditions downstream from the point of discharge near RM 22.3 down to RM 3.3. Total dissolved solids (TDS) water quality standard exceedances were also found below the mine discharges. To protect the biological integrity of Captina Creek, which includes state endangered Eastern Hellbender populations, it is recommended that OVCC and AEC provide better treatment of waste mine water to reduce the conductivity, metals, and TDS concentrations and minimize or eliminate discharges during low flow conditions.

Piney Creek is currently designated WWH but is recommended for CWH due to the presence of both coldwater fish and macroinvertebrate taxa. The fish attain the EWH biological criteria; however, the macroinvertebrates are adversely impacted by the high concentration of TDS, conductivity and metals from the American Energy Corporation mine discharge at river mile 2.8. Mayflies are very sensitive to TDS and are almost completely absent from Piney Creek downstream from the mine discharge. It is recommended that AEC provide better treatment of their discharge to remove the high TDS or to avoid discharging during low flow conditions when the TDS concentrations are exacerbated by lack of dilution. If this occurs, Piney Creek could potentially meet EWH. It is also recommended that sampling upstream from AEC on Piney Creek be conducted to determine if Piney is meeting EWH in the upper reaches.

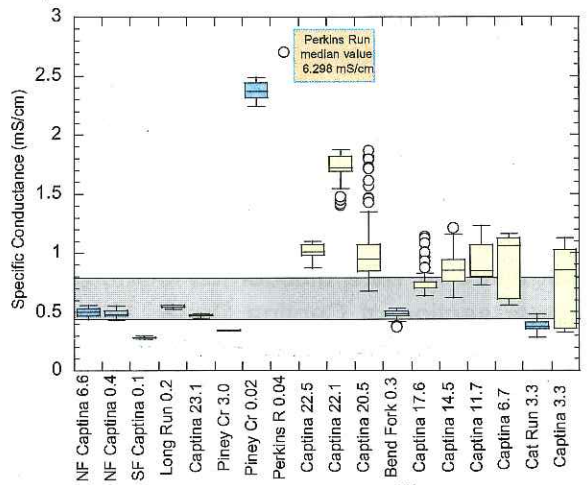

Figure 5. Conductivity values recorded by Datasonde™ continuous recorders in Captina Creek (shaded yellow) and select tributaries (shaded blue), summer 2009. Gray shaded areas represent the range between the median and 90th percentile values for relatively unimpacted reference sites in the WAP ecoregion (Ohio EPA 1992)

RESULTS

Metals were measured at 37 locations with 17 parameters tested (Appendix Table 1). Historic mining has occurred in the Captina Creek watershed and currently two mines, Ohio Valley Coal (OVCC) and American Energy Corporation (AEC), are located in the upper section of Captina Creek. Typically mining wastes and discharges can contribute high levels of acidity, metals (i.e. iron, aluminum, manganese, nickel, or zinc), total dissolved solids, high conductivity and low pHs. The limestone geology of the Captina Creek watershed has buffered these acidic contributions and kept the pH levels in the range acceptable for supporting aquatic life. However, elevated levels of total dissolved solids (TDS), metals and conductivity were found in Captina Creek, Perkins Run and

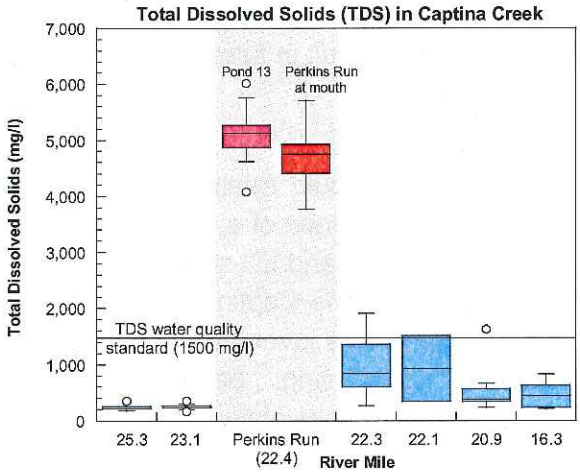

Figure 6. Total Dissolved Solids (TDS) in Captina Creek upstream and downstream from Perkins Run and Ohio Valley Coal outfall 013 discharge.

Piney Creek below the two mine discharges.

Both mines contribute a significant amount of TDS (Figure 6) and elevate the specific conductance of Captina Creek, Perkins Run and Piney Creek well above reference conditions typically found in the Western Allegany Plateau ecoregion (Figure 5). During low flow conditions in the survey, the conductivity levels in Captina Creek remained elevated from downstream of mine wastewater discharges to the confluence of the Ohio River for nearly 22 river miles. Iron, selenium, copper, nickel and TDS water quality standard violations were found at the mouth of Perkins Run which receives discharges from OVCC outfall 013 as well as the OVCC slurry impoundment (outfall 002). TDS water quality standard violations were also found in Piney Creek downstream from the AEC discharge and in Captina Creek downstream from Perkins Run and Piney Creek. Other mining parameters such as sodium, sulfate and aluminum were elevated above reference conditions in Perkins Run, Piney Creek and Captina Creek. Since 1999, Ohio EPA has documented at least seven coal slurry releases from the Ohio Valley Coal Company's impoundment to Captina Creek and one slurry spill from American Energy Corporation in 2005. The last slurry release from Ohio Valley Coal Company occurred on February 28, 2008 and discolored Captina Creek for over 22 river miles.

American Energy Corporation- Century Mine (Ohio EPA Permit # 0IL00091) The American Energy Corporation (AEC) – Century Mine located in Wayne Township near Township Road 88 and State Route 145 is a deep shaft coal mine and processing plant which has been in operation since 1969. The Century Mine is one of the leading suppliers of coal in the state of Ohio and a large employer in the region. The mined coal is brought to the surface where it is cleaned and processed prior to being loaded onto rail cars or semi trailers at loading facilities. The processing of the coal involves washing the coal to remove impurities which are then contained within a slurry mixture that is pumped to a large impoundment approximately 1,500 feet away at the Ohio Valley Coal (OVCC) facility. The slurry impoundment provides settling of the solids within the mixture as the wastewater is then discharged and monitored according to the terms and conditions of the NPDES permit for the OVCC facility. The two mines owned and operated by the Murray Energy Corporation share a large coal slurry impoundment for slurry generated from both mine processing areas.

The absence of a slurry impoundment for the AEC mine has required the facility to pump their slurry a long distance to the OVCC impoundment. The pumping of this waste has not been without incident over the last several decades with the most recent slurry spill occurring on August 23, 2005 On this date a portion of the pipeline ruptured creating a leak which led to the release of approximately 30,000 gallons of sludge into Captina Creek near the line break. The slurry spill impacted roughly 3,000 linear feet of the stream with heavy sludge deposits which coated the stream bed and banks as well as turning the creek black. Upon discovering the break AEC representatives reported the spill to Ohio EPA and an On Scene Coordinator (OSC) was dispatched for investigation and cleanup supervision. The sludge deposits were removed with industrial vacuum trucks and the stream banks cleaned with pressure washers. Although the cleanup was completed within a week a noticeable fish kill was observed at the time of the release. Directors Findings and Orders were issued for the American Energy slurry release which included a fine of $50,000 and development of an emergency response and spill

prevention plan. The American Energy Corporation Directors Findings and Orders can be found at the following link: epa.ohio.gov/portals/35/enforcement/AmericanEnergyCorp.pdf

**Note – another slurry spill occurred at AEC on October 1, 2010 similar to the spill that occurred in 2005 with a pipeline breach. Three Eastern Hellbenders were found alive but stressed within the spill zone. They were released near the area so it was not determined if they survived. Numerous dead fish were also found. Directors Findings and Orders are still pending for this spill*

The AEC mine has nine authorized wastewater discharge points consisting of industrial storm water runoff from coal refuse disposal sites, coal storage areas, mine water discharges and sanitary wastewater discharges from offices and bath houses serving the mine. The original three outfalls at the site were Outfall 008, 011, and 002 with Outfalls 008 and 011 consisting of mainly storm water discharges from the main preparation plant pond discharges. Outfall 011 combines the preparation plant storm water discharge with sanitary wastewater from the main bath house. The preparation plant discharge at Outfall 008 is authorized to discharge 0.190 MGD from a clean coal storage pad as well as storm water runoff from the coal preparation area. The preparation plant areas as well as coal refuse disposal site ponds that are listed as Outfalls 012 through 016 in the NPDES permit are monitored for iron, manganese, TSS, TDS and pH. Outfall 002 consists of mine shaft water which is mostly recycled and used for dust control in the mines.

In 2002 the NPDES permit for AEC was modified to add Outfalls 012 through 016 for expanded mining operations which generated multiple coal refuse disposal sites with sedimentation ponds for storm water runoff controls. The permit modification also allowed for additional sanitary wastewater to be mixed with existing Outfall 011 in addition to a sanitary discharge from a new 10,000 gpd extended aeration package plant to serve the main office and bath house.

Ohio Valley Coal Company Powhatan No. 6 Mine (Ohio EPA Permit # 0IL00046*DD) The Ohio Valley Coal Company (OVCC) Powhatan Number 6 mine is a large deep shaft coal mine and processing facility located near the intersection of State Route 148 and County Road 86 near the community of Alledonia. The OVCC facility is owned and operated by Robert Murray who also owns the AEC Century Mine which pumps coal slurry to the OVCC facility. The OVCC mine has authorization to discharge from five industrial process wastewater discharges which contain industrial storm water runoff from coal processing areas and a sanitary discharge from the main mine portal bath house.

Figure 7. Discharge from Pond 13 (outfall 013). Note the iron stains on the rocks.

The main discharge at the facility is from the slurry impoundment pond #2 which is listed as Outfall 001 in the NPDES permit. The slurry impoundment contains coal slurry generated through the washing of coal mined at the

OVCC and AEC mines. The impoundment is designed to handle an average daily design flow of 1.5 MGD of coal slurry. The outfall is monitored for the typical coal mining runoff parameters of iron, manganese, TSS, TDS, and pH prior to discharge into Perkins Run. Pond 13 (Outfall 013) is a leachate collection pond located below the slurry impoundment and also discharges to Perkins Run. The discharge from Outfall 013 is treated with potassium permanganate to drop out metals before discharging to Perkins Run. The pond is currently undersized and as a result, permit violations have occurred for iron and manganese as well as exceedances of the water quality standards for TDS.

In addition to iron and manganese, other elevated metals that have been found from outfall 013 include aluminum, barium, cadmium, copper, strontium, nickel, selenium, mercury and zinc. A compliance sample collected on March 5, 2008 documented iron levels in Pond 13 at 17,700 µg/l which exceeded the daily maximum permit limit of 7,000 µg/l. Figure 7 shows the iron stained rocks below the discharge from pond 13. Manganese levels were 4,640 µg/l which also exceeded the maximum daily permit limit of 4,000 µg/l. Total dissolved solids were also highly elevated with a value of 4,080 mg/l. Macroinvertebrates were sampled in Perkins Run on May 5, 2008 downstream from the Pond 13 discharge. The macroinvertebrate community was very poor which is indicative of a toxic effect most likely caused from the discharges from outfalls 001 and 013. On July 21 and 22, 2008, a bioassay sample was collected at the mouth of Perkins Run and was found to be acutely toxicity to the *Ceriodaphnia dubia* with a mortality of 85 percent within 48 hours.

The washed and processed coal is stockpiled next to a rail load out facility adjacent to Captina Creek with storm water runoff from the area monitored from the #7 sedimentation pond that discharges to Captina Creek. This pond discharge is listed as Outfall 011 in the NPDES permit and monitored for the same constituents as the slurry impoundment discharge. The beltline which delivers the processed coal from the preparation plant to the loading facility also has a storm water runoff control pond known as pond # 8. This pond discharges to Captina Creek and is listed as Outfall 007 in the NPDES permit and monitored for the same constituents as Outfall 011. The final permitted outfall for the OVCC facility is listed as Outfall 002 in the discharge permit and contains the treated sanitary sewer discharge from a 3,000 gpd extended aeration package plant. The wastewater treatment plant discharges to pond 7 and is monitored for typical sanitary wastewater constituents such as ammonia, biochemical oxygen demand, TSS, and fecal coliform bacteria.

Figure 8. Captina Creek water samples collected after the Ohio Valley Coal slurry release on Feb. 28, 2008. The container on the left is a water sample from Captina Creek upstream from the slurry release and the container on the right is a water sample from Captina Creek downstream from the slurry

The large discharge from the OVCC facility is the main slurry impoundment (outfall 001) which is designed for the treatment of 1.5 MGD

of coal slurry which contains sediment, metals, and dissolved solids. Water quality sampling in Perkins Run showed elevated concentrations of the typical mine drainage constituents as well as ammonia. The sampling results of Perkins Run also showed water chemistry results for specific conductivity to be greater than five times the conductivity level measured on Captina Creek upstream of the confluence with Perkins Run. All three Captina Creek sampling sites downstream of the confluence of Perkins Run showed elevated TDS concentrations above the Ohio Water Quality Standards criteria.

Since 1999, Ohio EPA has documented at least seven slurry releases from the Ohio Valley Coal company's impoundment to Captina Creek. The last slurry release from Ohio Valley Coal occurred on February 28, 2008 and discolored Captina Creek for over 22 river miles (Figure 8). Ohio Valley Coal also had a slurry release on July 10, 2007, one slurry release on January 2, 2006, two slurry releases in 2004 (July 31 and August 8), one in 2000 (April 22), and one in 1999 (July 8).

Sediment from the February 2008 slurry release was collected from Perkins Run and was analyzed for organics and metals. The organic and metal parameters that were detected in the slurry sludge deposits collected from Perkins Run are summarized in Table 8 and Table 9. Numerous organics and metals were found above the detection limit. Many of the semi-volatile compounds that were detected exceeded the MacDonald et. al. threshold effect concentrations (TEC). The TEC numbers are intended to determine if sediment may present risks to aquatic organisms. In numerous cases, the levels of contaminants were several orders of magnitude above the screening levels indicating the potential to adversely impact aquatic organisms. Several of the chemicals that were detected at levels well above the TECs are in the same class of chemicals known as polycyclic aromatic hydrocarbons (PAHs). Most of these chemicals have the same toxic mechanism of action, and thus their effects can be additive, meaning that these exceedences may have an effect beyond that of each chemical taken individually.

Table 8. Organic parameters that were detected in slurry sludge deposits collected from Perkins Run on March 5, 2008 just downstream from the location of the Ohio Valley Coal slurry release. The Ecological Screening Levels for sediment are based on MacDonald et al. 2000 threshold effect concentration (TEC).

parameter	units	Result (OVCC slurry)	Ecological Screening Levels
% Solids	%	65.5	--
2,4-Dimethylphenol	mg/kg	1.27	--
2-Methylnaphthalene	mg/kg	30	--
2-Methylphenol	mg/kg	0.75	--
3&4-Methylphenol	mg/kg	0.83	--
Acenaphthene	mg/kg	0.9	0.00671
Benz[a]anthracene	mg/kg	0.78	0.108
bis(2-Ethylhexyl)phthalate	mg/kg	0.67	--
Chrysene	mg/kg	0.83	0.166
Dibenzofuran	mg/kg	4.26	--
Ethylbenzene	mg/kg	9	--
Fluoranthene	mg/kg	0.7	0.423
Fluorene	mg/kg	2.19	0.0774
Naphthalene	mg/kg	25.1	0.176
Phenanthrene	mg/kg	6.93	0.204
p-Xylene	mg/kg	10	--
Pyrene	mg/kg	1.26	0.195
Toluene	mg/kg	9	--

Table 9. Metal parameters that were detected in slurry sludge deposits collected from Perkins Run on March 5, 2008 just downstream from the location of the Ohio Valley Coal slurry release.

parameter	units	Result	Sediment Reference Values
% Solids	%	65.5	--
Arsenic	mg/kg	18.8	19
Cadmium	mg/kg	0.174	0.8
Chromium	mg/kg	16.3	53
Copper	mg/kg	15.0	33
Lead	mg/kg	9.84	47
Nickel	mg/kg	14.9	61
Selenium	mg/kg	1.10	2.6
Aluminum	mg/kg	8580	53000
Barium	mg/kg	70.1	360
Calcium	mg/kg	15100	27000
Iron	mg/kg	16700	51000
Magnesium	mg/kg	1490	9900
Manganese	mg/kg	117	3000
Potassium	mg/kg	2590	14000
Strontium	mg/kg	115	250
Zinc	mg/kg	48.6	170
Mercury	mg/kg	0.046	0.12